REMARKS

This paper is responsive to an Office Action mailed January 18, 2006. Prior to this response, claims 1-32 were pending. After amending claims 1, 3, 5-6, 8-10, 14, 22-25, 27-28, and 30, and adding new claims 33-38, claims 1-38 remain pending.

Section 2 of the Office Action objects to the use of colon in claim 3. Claim 3 has been amended to remove the colon.

In Section 4 of the Office Action claims 1-6, 9, 18, and 32 have been rejected under 35 U.S.C. 102(e) as anticipated by Belyansky (US 2004/0129673). The Office Action states that Belyansky describes all the limitations of the claimed invention. This rejection is traversed as follows.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Belyansky describes a low-temperature HD plasma process for oxidizing a silicon-containing substrate (Abstract). While only crystalline Si and SiN were specifically tested ([0034] and Fig. 2), Belyansky suggests that his process is also applicable to oxidizing a SiC substrate [0028]. The purpose of Belyansky's process is to produce a uniform oxide film at a high growth rate [0029].

The Applicant's claim 1 has been amended to recite that the atmosphere includes He and oxygen. Belyansky specifically states that He is a non-preferred mixing gas, because it does not support a rapid

growth rate. Since Belyansky does not describe a preferred He mixing gas, he does disclose all the limitations of claims 1 and he cannot anticipate the claim. Claims 2-6, 9, and 18, dependent from claim 1, enjoy the same distinctions from the cited prior art.

With respect to claim 32, Belyansky is absolutely silent as to the mechanism behind the formation of silicon oxide. More specifically, nowhere in the disclosure does Belyansky mention the breaking the Si-C bonds in the SiC substrate, to form free Si and C atoms in the SiC substrate or the bonding the free Si atoms to a plasma-generated reactive oxygen species. Therefore, Belyansky does not describe all the limitations of the claim.

With respect to new claim 33 Belyansky fails to describe the bonding of free Si atoms in the SiC substrate to a plasma-generated reactive oxygen species. Therefore, Belyansky does not describe all the limitations of the claim.

With respect to claim 34, Belyansky fails to describe an atmosphere with less than 10% oxygen. In fact, Belyansky specifically states that the oxygen ratio be at least 10%, and preferably be at least 20% [0029]. Therefore, Belyansky does not describe all the limitations of the claim.

With respect to claim 35, Belyansky fails to describe a SiOx film with the recited film characteristics. As described in more detail below, Belyansky's process appears to be directed towards high growth rate/bulk films. The characteristics recited in claim 35 are conventionally associated with high-temperature thermal oxide processes. Therefore, Belyansky does not describe all the limitations of the claim.

With respect to claim 36, Belyansky fails to describe a HD PECVD process that deposits silicon oxide on a substrate. Therefore, Belyansky does not describe all the limitations of the claim.

With respect to claim 37, Belyansky fails to describe a silicon dioxide growth rate of less than 10 Å per minute (0.17 Å per second). As noted in [0029], Belyansky describes a growth rate of 0.25 to 1 Å per second. The slower growth rate associated with the Applicant's process accounts for superior film characteristics (as recited in claims 15-17). Therefore, Belyansky does not describe all the limitations of the claim.

With respect to new claim 38 Belyansky fails to describe the deposition of a Si layer overlying the SiC, prior to performing the HD plasma process. Therefore, Belyansky does not describe all the limitations of the claim.

In Section 8 of the Office Action claims 7-8 and 19-23 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Belyansky. With respect to claim 7, the Office Action acknowledges that Belyansky fails to describe removing CO formed by the reaction of oxygen and free C atoms. The Office Action states that it would have been obvious to evacuate CO from the chamber during the process. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

> First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the

> art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

With respect to the first *prima facie* requirement, Applicant's amended claim 1 recites the use of He with oxygen. As noted above in response to the anticipation rejection, Belyansky clearly states that he prefers not the use light noble gases such as He [0029].

"That prior art patents may have described their failed attempts or attempts that used different elements is not enough. The prior art must be enabling." *Motorola Inc. v. Interdigital Tech. Corp.*, 121 F.3d 1461, 1471, 43 USPQ2d 1481, 1489, (Fed. Cir. 1997). ("In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." (quoting *Beckman Instruments Inc. v. LKB Produker AB*, 892 F.2d 1547, 1551, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989), *aff'd without op*, 930 F.2d 37 (1991)).

Since Belyansky points away from the use of He gas, it cannot be said that there is a suggestion to modify Belyansky in a manner that makes the invention of claim 1 obvious. Likewise, from the perspective of the second *prima facie* requirement, a person of skill in the art would not have a reasonable expectation of success in creating the present invention using Belyansky as a foundation, since Belyansky points away from the use of He.

Attached is the affidavit of Dr. Yoshi Ono, which is submitted to support the Applicant's arguments. Among the points made by Dr. Ono is that Belyansky's process uses an oxygen gas concentration of greater

than 10%, which points away from the use of He. Dr. Ono states that the Ar mixture gas preferred by Belyansky supports a higher growth rate when higher oxygen concentrations are used, but that He supports a higher growth rate when the atmosphere includes less than 10% oxygen.

With respect to the third *prima facie* requirement, as noted above, Belyansky does not explicitly describe all the limitations of claim 1, or suggest modifications that would make these limitations obvious. Claims 7-8 and 19-23, dependent from claim 1, enjoy the same distinction from the cited prior art, and the Applicant requests that the rejection be removed.

In Section 9 of the Office Action claims 10-14 and 24-30 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Belyansky, in view of Ouellet (US 2003/0059556). With respect to claims 10-14, the Office Action acknowledges that Belyansky fails to teach the recited gas ratios. The Office Action further states that it would have been obvious to modify Belyansky using Ouellet's PECVD method. This rejection is traversed as follows.

With respect to the first and second *prima facie* requirements, the gas flows, power ranges, gas ratios, and system pressures from a PECVD process have almost absolutely no relevance to an HD PECVD process. Generally, the PECVD process still relies on the substrate temperature to drive the reaction, while the HD PECVD process uses the kinetic energy of the ions. Further, Ouellet does not suggest that Belyansky can be modified to use a HD PECVD process to deposit a layer of silicon oxide overlying the substrate, as recited in Applicant's claims 10 and 24.

In his affidavit Dr Ono states that Ouellet's optical quality silica has very little relevance to the oxides needed for IC semiconductor processes. Further, it is Dr. Ono's opinion that an expert in the field could not successfully merge aspects of a PECVD process into an HD plasma oxidation process.

With respect to the third *prima facie* requirement, Ouellet teaches the deposition of silica using a conventional PECVD process. Belyansky teaches the oxidation of a substrate using an HD plasma process. Therefore, even if the references are combined, that combination does not explicitly teach an HD PECVD to deposit silicon oxide. Alternately stated, the combination of references would not enable a person skilled in the art to deposit silicon oxide using an HD PECVD process. Therefore, the combination of references does not describe all the limitations of Applicant's claims 10 and 24. Claims 11-14 and 18, dependent from claim 10, and claims 25-30, dependent from claim 24, enjoy the same distinctions from the cited prior art, and the Applicant requests that the rejection be withdrawn.

In Section 10 of the Office Action claims 15-17 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Belyansky, in view of Ouellet and Chen (US 4,888,820). Chen has been presented to address the issue of silicon oxide film characteristics. This rejection is traversed as follows.

With respect the first and second *prima facie* requirements, the fact that Chen describes film characteristic provides absolutely no guidance to a person of skill in the art as the how such a film can be made. Ouellet describes a process for making an optical quality silica. The quality requirements for silica are much less stringent that the high

quality "thermal" oxide type film described in Applicant's claims 15-17. Belyansky describes a high growth rate process in a high oxygen environment (at least 20% as stated in [0029]). There are no practical suggestions in either the Ouellet or Chin references that suggest how Belyansky's process could be modified to produce silicon oxide with the characteristics described in claims 15-17.

With respect to the third *prima facie* requirement, none of the references describe a process for making a silicon oxide film with the characteristics described in claims 15-17. Therefore, none can be said to suggest any modification to Belyansky's process that would make these missing limitations obvious, and the Applicant requests that the rejection be withdrawn.

In Section 11 of the Office Action claim 31 has been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Belyansky, in view of Furukawa (US 5,135,885). The Office Action acknowledges that Belyansky fails to describe etching of the silicon oxide and forming metal in the exposed region. The Office Action states that Furukawa describes such a process, and that it would have been obvious to combine the references. This rejection is traversed as follows.

With respect to the first and second *prima facie* requirements, even if the Belyansky and Furukawa references are combined, the combination does not suggest that Belyansky's process be modified to use a He gas, as recited in Applicant's claim 1.

With respect to the third prima facie requirement, neither of the references explicitly describes the use of He gas in an HD plasma process. Neither does Furukawa suggest any modifications to Belyansky that would make this missing limitation obvious. Claim 31, dependent

from claim 1, enjoys the same distinction, and the Applicant requests that the rejection be withdrawn.

It is believed that the application is in condition for allowance and reconsideration is earnestly solicited.

Respectfully submitted,

Date: 4/6/2006

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